# OBSERVATIONS & RECOMMENDATIONS

Concerned residents contacted the New Hampshire Department of Environmental Services' Biology Section in the spring of 2002 to discuss possible water quality impacts of a commercial summer camp. A monitoring program was set up to evaluate potential degradation of the water and wetlands of the Snake River.

The Snake River is located between Lake Winona and Lake Waukewan. Specifically, the Snake River begins at the outlet of Lake Winona and flows to the inlet of Lake Waukewan. The site of the summer camp and canoe launch site is located along the Snake River near the entrance to Lake Waukewan.

The VLAP Coordinator and the Limnology Center Director recommended that the residents conduct volunteer monitoring along the river to determine the baseline water quality of the river and to determine if the river experiences a decrease in water quality in response to the operation of the camp. Based on the information provided by the residents, Station 1 appears to be located immediately downstream of the camp, while stations 2, 3, and 4 appear to be located upstream of the camp (with Station 4 being located the furthest upstream at the outlet of Lake Winona).

The residents sampled at four locations along the river on **July 14, 2005.** It is unclear to DES if this sampling event was conducted during or after the operation of the camp. Also, since only one sampling event was conducted during 2005, it is not possible to make any conclusions regarding if the operation of the camp is affecting the water quality of the river. Samples for pH, total phosphorus, conductivity and turbidity were collected and analyzed in the DES Limnology Center.

We would like to encourage your monitoring group to formally participate in the DES Weed Watchers program, a volunteer program dedicated to monitoring lakes and ponds for the presence of exotic aquatic plants. This program only involves a small amount of time during the summer months. Volunteers survey their waterbody once a month from **June** through **September**. To survey, volunteers slowly boat, or even snorkel, around the perimeter of the waterbody and any islands it may contain. Using the materials provided in the Weed Watchers Kit, volunteers look for any species that are of suspicion. After a trip or two around the waterbody, volunteers will have a good knowledge of its plant community and will immediately notice even the most subtle changes. If a suspicious plant is found, the volunteers will send a specimen to DES for identification. If the plant specimen is an exotic, a biologist will visit the site to determine the extent of the problem and to formulate a plan of action to control the nuisance infestation. Remember that early detection is the key to controlling the spread of exotic plants.

If you would like to help protect your lake or pond from exotic plants, contact Amy Smagula, Exotic Species Program Coordinator, at 271-2248 or visit the Weed Watchers web page at www.des.state.nh.us/ wmb/exoticspecies/survey.htm.

**TABLE INTERPRETATION**

- **Table 4: pH**
  Table 4 (Appendix B) presents the in-lake and tributary current year and historical pH data.

  pH is measured on a logarithmic scale of 0 (acidic) to 14 (basic). pH is important to the survival and reproduction of fish and other aquatic life. A pH below 6.0 limits the growth and reproduction of fish. A pH between 6.0 and 7.0 is ideal for fish. The mean pH value for the epilimnion (upper layer) in New Hampshire's lakes and ponds is **6.6**, which indicates that the surface waters in the state are slightly acidic. For a more detailed explanation regarding pH, please refer to the "Chemical Monitoring Parameters" section of this report.

  The pH on the **July** sampling event ranged from **6.54 (at Site 1)** to **6.76 (Site 4)** means that the water is ***slightly acidic.*** In addition, the data indicates that the pH was ***approximately the same*** at all stations and is ***relatively consistent*** with the data from the 2002, 2003, and 2004 sampling seasons.

Due to the presence of granite bedrock in the state and acid deposition (from snowmelt, rainfall, and atmospheric particulates) in New Hampshire, there is not much that can be done to effectively increase surface water pH.

- **Table 6: Conductivity**

  Table 6 (Appendix B) presents the current and historical conductivity values for tributaries and in-lake data. Conductivity is the numerical expression of the ability of water to carry an electric current (which is determined by the number of negatively charged ions from metals, salts, and minerals in the water column). The mean conductivity value for New Hampshire's lakes and ponds is **59.4 uMhos/cm**. For a more detailed explanation, please refer to the "Chemical Monitoring Parameters" section of this report.

  The conductivity on the **July** sampling event ranged from **69.80 Mhos/cm** at **Site 4** (located at the outlet of Lake Winona) to **76.65 uMhos/cm** at **Site 1** (located downstream of the camp and near the inlet to Lake Waukewan).

  This data indicates that the conductivity ***increased gradually*** as the river flowed from **Site 4** to **Site 1** on the **July** sampling event. This trend is **consistent** with the trend that was observed during the **2002, 2003,** and **2004** sampling seasons.

  Overall, the conductivity in the river is ***greater than*** the state mean for lakes and ponds. However, it is important to point out that the conductivity level at each station on the July sampling event was ***less than*** what was measured at each station during the **2002, 2003,** and **2004** sampling seasons.

  Typically conductivity levels greater than 100 uMhos/cm indicate the influence of human activities on surface water quality. Activities include septic systems that fail and leak leachate into the groundwater (and eventually into the tributaries and the lake/pond), agricultural runoff, and road runoff (which contains road salt during the spring snow melt). New development in the watershed can alter runoff patterns and expose new soil and bedrock areas, which could contribute to increasing conductivity. In addition, natural sources, such as iron deposits in bedrock, can influence conductivity.

  It is possible that de-icing materials applied to nearby roadways during the winter months may be influencing the conductivity in the river and ultimately in Lake Waukewan. In New Hampshire, the most commonly used de-icing material is salt (sodium chloride).

Therefore, we recommend that each sampling location be sampled for chloride next season. This sampling may help us pinpoint what areas of the watershed which are contributing to the increasing in-lake conductivity.

*Please note that there will be an additional cost for each of the chloride samples and that these samples must be analyzed at the DES laboratory in Concord. In addition, it is best to conduct chloride sampling in the spring as the snow is melting and during rain events.*

- **Table 8: Total Phosphorus**

  Table 8 (Appendix B) presents the current year and historical total phosphorus data for in-lake and tributary stations. Phosphorus is the nutrient that limits the algae's ability to grow and reproduce. Please refer to the "Chemical Monitoring Parameters" section of this report for a more detailed explanation.

  On the **July** sampling event, the total phosphorus concentration at **Site 4** was ***less than* 5 ug/L,** at **Site 3** was **7 ug/L,** at **Site 2** was **9 ug/L,** and at **Site 1** was **7 ug/L.**

  These data indicate that the total phosphorus concentration generally increased as the river flowed from **Station 4** to **Station 1.** It is important to point out that each of the phosphorus concentrations measured in **July** were ***relatively low.***

- **Table 11: Turbidity**

  Table 11 (Appendix B) lists the current year and historical data for in-lake and tributary turbidity. Turbidity in the water is caused by suspended matter, such as clay, silt, and algae. Water clarity is strongly influenced by turbidity. Please refer to the "Other Monitoring Parameters" section of this report for a more detailed explanation.

  The turbidity on the **July** sampling event ranged from **0.52 NTUs** at **Site 1** to **1.08 NTUs** at **Site 4**.

  This data indicates that the turbidity along the river on the **June 16** sampling event ***was relatively low*** along the entire length of the river from Lake Winona to Lake Waukewan.

- **Table 14: Current Year Biological and Chemical Raw Data**
  This table is a new addition to the Annual Report. This table lists the most current sampling season results. Since the maximum, minimum, and annual mean values for each parameter are not shown on this table, this table displays the current year "raw" (meaning unprocessed) data. The results are sorted by station, depth zone (epilimnion, metalimnion, and hypolimnion) and parameter.

- **Table 15: Station Table**
  As of the Spring of 2004, all historical and current year VLAP data are included in the DES Environmental Monitoring Database (EMD). To facilitate the transfer of VLAP data into the EMD, a new station identification system had to be developed. While volunteer monitoring groups can still use the sampling station names that they have used in the past (and are most familiar with), an EMD station name also exists for each VLAP sampling location. For each station sampled at your lake or pond, Table 15 identifies what EMD station name corresponds to the station names you have used in the past and will continue to use in the future.

## DATA QUALITY ASSURANCE AND CONTROL

### Sample Receipt Checklist:

Each time your monitoring group dropped off samples at the laboratory this summer, the laboratory staff completed a sample receipt checklist to assess and document if the volunteer monitors followed proper sampling techniques when collecting the samples. The purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future re-occurrences of improper sampling techniques.

Overall, the sample receipt checklist showed that your monitoring group did an ***excellent*** job when collecting samples and submitting them to the laboratory this season! Specifically, the members of your monitoring group followed the proper field sampling procedures and there was no need for the laboratory staff to contact your group with questions, and no samples were rejected for analysis.

**USEFUL RESOURCES**

*Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials*, NHDES Booklet WD-03-42, (603) 271-2975.

*Canada Geese Facts and Management Options,* NHDES Fact Sheet BB-53, (603) 271-2975 or www.des.state.nh.us/factsheets/bb/bb-53.htm.

*Cyanobacteria in New Hampshire Waters Potential Dangers of Blue-Green Algae Blooms*, NHDES Fact Sheet WMB-10, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-10.htm.

*Erosion Control for Construction in the Protected Shoreland Buffer Zone*, NHDES Fact Sheet WD-SP-1, (603) 271-2975 or www.des.state.nh.us/factsheets/sp/sp-1.htm.

*Impacts of Development Upon Stormwater Runoff,* NHDES Fact Sheet WD-WQE-7, (603) 271-2975 or www.des.state.nh.us/factsheets/wqe/wqe-7.htm.

*Low Impact Development Hydrologic Analysis.* Manual prepared by Prince George's County, Maryland, Department of Environmental Resources. July 1999. To access this document, visit www.epa.gov/owow/nps/lid_hydr.pdf or call the EPA Water Resource Center at (202) 566-1736.

*Proper Lawn Care In the Protected Shoreland, The Comprehensive Shoreland Protection Act,* NHDES Fact Sheet WD-SP-2, (603) 271-2975 or www.des.state.nh.us/factsheets/sp/sp-2.htm.

*Road Salt and Water Quality,* NHDES Fact Sheet WD-WMB-4, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-4.htm.

*Sand Dumping - Beach Construction*, NHDES Fact Sheet WD-BB-15, (603) 271-2975 or www.des.state.nh.us/factsheets/bb/bb-15.htm.

*Soil Erosion and Sediment Control on Construction Sites,* NHDES Fact Sheet WQE-6, (603) 271-2975 or www.des.state.nh.us/factsheets/wqe/wqe-6.htm.

*Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants*, NHDES Fact Sheet WD-BB-4, (603) 271-2975 or www.des.state.nh.us/factsheets/bb/bb-4.htm.

*Watershed Districts and Ordinances,* NHDES Fact Sheet WD-WMB-16, (603) 271-2975 or www.des.state.nh.us/factsheets/wmb/wmb-16.htm.